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Compassionate Love Buffers Stress-Reactive Mothers From Fight-or-Flight Parenting

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Abstract

The links among mothers' compassionate love for their child, autonomic nervous system activity, and parenting behavior during less and more challenging mother–child interactions were examined. Mothers expressed and reported less negative affect when they exhibited autonomic patterns of increased parasympathetic dominance (high parasympathetic and low sympathetic activation) or autonomic coactivation (high parasympathetic and high sympathetic activation) during the less challenging interaction and autonomic coactivation during the more challenging interaction. Compassionate love predicted less reported and observed negativity in mothers who showed increased sympathetic nervous system dominance (high sympathetic and low parasympathetic activation). Compassionate love appeared to help mothers, and particularly those who experienced strong physiological arousal during difficult parenting situations, establish positive socialization contexts for their children and avoid stress-induced adverse parenting.

Keywords

compassionate love; parenting; autonomic; sympathetic; parasympathetic

Compassionate love can be defined as a collection of attitudes, cognitions, emotions, and actions related to selfless concern and giving of oneself for the wellbeing of others (Underwood, 2009). This concept is related to but is not synonymous with compassion, defined as an affective response to the suffering of another that motivates helping and a desire to alleviate that suffering (Goetz, Keltner, & Simon-Thomas, 2010). Rather than referring to a specific affective state or being limited to the suffering of others, compassionate love also includes efforts to promote others' human flourishing and growth. Key features of compassionate love include freely making choices to give oneself for the good of the other; some degree of an accurate understanding of oneself (e.g., own habits and limitations), the other person (e.g., their needs and feelings), and the situation (e.g., what might help promote the other's well-being); valuing and respecting another person regardless of their imperfections; and heartfelt, positive, emotional engagement (Underwood, 2009). Compassionate love has been described as being similar to

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unconditional love and at its core is ultimately about giving of the self for the good of the other.

In family contexts, parents show compassionate love toward their own children by responding to children's distress with sympathy and supportive behaviors and through child-focused efforts to foster children's positive development and flourishing. Engaging in such positive parenting practices can be difficult when interactions or contexts are challenging and stressful (Crnic & Low, 2002), but mindfulness training aimed at cultivating compassion has been shown to decrease parental stress (Benn, Akiva, Arel, & Roeser, 2012) and improve the quality of parenting and parent–child relationships (Coatsworth, Duncan, Greenberg, & Nix, 2010). Effective autonomic regulation of stress also supports positive parenting behaviors (Mills-Koonce et al., 2009). We conducted a biopsychosocial examination of how mothers' compassionate love for their child and mothers' autonomic nervous system activity was associated with parenting behavior across interaction tasks that varied in the extent to which they challenged the mother–child dyad.

The sympathetic (SNS) and parasympathetic (PNS) branches of the autonomic nervous system (ANS) have been associated with parenting behaviors (Sturge-Apple, Skibo, Rogosch, Ignjatovic, & Heinzelman, 2011). Increased SNS activation prepares the body for fight-or-flight responding to perceived threat (i.e., increased heart rate and cardiac output) whereas increased PNS activation results in slower heart rate, promotes restorative processes in the body, and supports social engagement (Porges, 2011). In stressful contexts, effective parenting behaviors are supported by increasing activation of systems important for other-oriented caregiving and inhibiting competing systems involved in avoidance and defensive responding (i.e., fight-or-flight) (Brown, Brown, & Preston, 2011). Conversely, increased threat-related engagement of the SNS could interfere with or override neurobiological systems important for motivating effective caregiving. In accordance with this perspective, elevated SNS activity in mothers has been linked to increased negative affect and harsh parenting (Bugental et al., 1993; Sturge-Apple et al., 2011) whereas higher PNS activity has been associated with sensitive parenting (Joosen et al., 2013).

The SNS and PNS work together to control or regulate cardiac activity and can exhibit a reciprocal relationship of relatively greater parasympathetic or relatively greater sympathetic dominance (i.e., cardiac autonomic balance; CAB), but can also yield patterns of coactivation and coinhibition of the two branches of the ANS (i.e., overall cardiac autonomic regulation; CAR) (Berntson, Norman, Hawkley, & Cacioppo, 2008). Thus, different physiological states characterized by different interactions of PNS and SNS activity can be represented using two dimensions: (a) balance between activation in the two branches and (b) overall autonomic control or regulation of cardiac activity. High CAB typically applies to physiological states characterized by high PNS activation coupled with low SNS activation (PNS dominance) whereas low CAB reflects the opposite (i.e., SNS dominance). Conversely, high overall CAR is characterized by coactivation in the two ANS branches (high PNS coupled with high SNS activation), and low overall CAR is characterized by coinhibition (low PNS coupled with low SNS activation) (Berntson, Cacioppo, & Quigley, 1993).

From this bivariate approach, high SNS activation coupled with low PNS activation (low CAB) may support a fight-or-flight response and undermine warm, affectionate parenting in challenging parenting contexts. Conversely, mothers' increased PNS activation may help counteract the effects of high SNS activation (high CAR). For mothers in challenging parent–child interactions, this may include downregulating defensive, threat-related responding and upregulating positive social and emotional engagement (Brown et al., 2011). Simply looking at activity in the PNS or SNS in isolation does not allow for the distinction of these different kinds of autonomic states. However, research has yet to examine the physiological underpinnings of parenting from a perspective that considers balance and overall control dimensions of ANS activity.

Psychological and social processes can buffer against physiological vulnerabilities for behavioral and emotional difficulties (Gyurak & Ayduk, 2008; Hastings, Kahle, & Han, 2014). Some mothers may use their compassionate love as an emotional resource for avoiding harsh caregiving in difficult situations that elicit strong physiological arousal. Adopting a stance of acceptance and compassion toward one's child may help mothers who experience stronger SNS activation in response to challenge to focus on providing parental support rather than reacting to their own heightened physiological arousal. Compassion training has been shown to promote effective emotion regulation strategies and help buffer against stress reactivity (Jazaieri et al., 2014; Pace et al., 2009). These training interventions aim to develop attitudes of openness and acceptance to experience, which may help foster interpersonal closeness and tolerance of negative emotions (Duncan, Coatsworth, & Greenberg, 2009; Jazaieri et al., 2014). Likewise, compassionate love in the context of parenting may help mothers to bring an attitude of kindness and tolerance of negative emotions to difficult interactions with their children. These features of compassionate love may support mothers maintaining positive social engagement in the face of challenge.

This study examined whether mothers' compassionate love for their children supported positive parenting and buffered against adverse parenting under stress. We examined maternal parasympathetic and sympathetic activation and parenting behavior during naturalistic mother–child interactions that imposed less or more challenge or stress on the dyad. In accordance with the Polyvagal perspective that higher levels of parasympathetic activation support calm, social engagement (Porges, 2011), we expected greater overall CAR (coactivation) or CAB (relative parasympathetic dominance) during challenge to emerge as a psychophysiological mechanism of positive parenting. Greater maternal compassionate love for her child was also expected to predict more positive parenting and to buffer mothers with less effective physiological regulation (e.g., lower CAB; relative sympathetic dominance) from engaging in harsh parenting.

Method

Participants

This study included 83 mothers (M = 36.52 years, SD = 5.19) of 3.5-year-old children (M = 3.56 years, SD = 0.12; 46 girls, 37 boys) in 72 married two-parent families, 3 unmarried two-parent families, and 8 single-mother families. Families were predominantly Caucasian (73.5%). The average family income was between $75,000 and $90,000 (range from less

than $15,000 to over $120,000). All children were biologically related to their mothers and had typical cognitive and physical development.

Procedure

Data were collected in the context of a 2.5-hr laboratory visit. After a 20-min consent and familiarization period, electrodes were attached to mothers and their children to obtain electrocardiograph (ECG) and impedance cardiograph (ICG) signal. Three disposable electrodes were attached to the chest using a lead II placement to collect ECG signal. Four electrodes were placed on the torso (two on chest and two on back; Sherwood et al., 1990) to collect ICG signal. Cardiac data were collected using Mindware Technologies ambulatory monitors (Gahanna, OH) and were wirelessly transmitted to a computer for storage and processing. Approximately 20 min after attaching the ambulatory monitors, mother–child dyads were seated together at a table and completed a series of joint activities, including working on a puzzle and making origami. These tasks were chosen to assess maternal behaviors and physiological activity in parent–child interactions that imposed lower and higher levels of challenge, respectively. Approximately 45 min after the completion of the parent–child interactions, mothers completed questionnaires to assess their compassionate love for their child, compassionate love for humanity, and parenting behaviors.

Measures

Compassionate love—Mothers completed the 21-item Compassionate Love Scale for Close Others to report on their compassionate love for their child (Sprecher & Fehr, 2005) (e.g., “I often have tender feelings toward my child when she/he seems to be in need,” α = .86). Mothers also completed the 21-item Compassionate Love Scale for Humanity (Sprecher & Fehr, 2005) (e.g., “I tend to feel compassion for people, even though I do not know them,” α = .95).

Harsh parenting—Mothers completed the Parenting Styles and Dimensions Questionnaire (child (Robinson, Mandleco, Olsen, & Hart, 2001). Scores on the Verbal Hostility (e.g., “I yell or shout when my child misbehaves”), Corporal Punishment (e.g., “I spank when my child is disobedient”), Non-Reasoning Punishment (e.g., “I use threats as punishment with little or no justification”), and Directive/Scold (e.g., “I scold and criticize to make my child improve.”) subscales were aggregated to form an index of reported harsh parenting (α = .69).

Puzzle task—Mothers performed a puzzle with their child. The puzzle was recommended for older children and could not be completed by 3.5-year-old children alone. The mother was told to just give her child as much help as she thought her child needed to finish the puzzle and that they would have 5 min to work on it. This task was meant to be modestly challenging.

Origami task—Mother–child dyads then performed an origami-folding task. Children were provided with a piece of colored origami paper, and mothers were given a piece of paper with pictures of the steps necessary to fold the origami paper into a puppy’s face. The mother was told that she should use these instructions to show her child how to fold the

paper, but that the child should do all of the folding and that the mother should not touch the origami paper herself. Mother–child dyads were given 5 min to finish the origami task. This task was meant to be highly challenging, and only 25 mothers in our sample (30%) were able to follow the instructions to not touch the paper. The origami task has been used in several other studies (Hane, Cheah, Rubin, & Fox, 2008; Hastings et al., 2008), and it was originally designed to be particularly challenging for mothers and young children.

Observed maternal warmth and negativity—Video recordings of the puzzle and origami tasks were coded for maternal warmth and negativity in 30-s time segments using 5-point scales (1 = *absent* to 5 = *strong*, *repeated*). Behaviors contributing to maternal warmth included affection, praise, encouragement, smiling, use of pet names, hugs, and gentle touches. Interrater reliability was computed for 20% of the sample; $\alpha = .89$ for the puzzle and .79 for the origami. Behaviors contributing to maternal negativity included criticism, disapproval, frowning, subtle signs of irritation such as eye rolls, threats, and aggravated or angry tone. Interrater reliability was computed for 20% of the sample; $\alpha = .76$ for the puzzle and .75 for the origami. Mean scores of the ratings across 30-s epochs were used as overall indices of maternal warmth and negativity.

Preejection period—ECG and ICG data were processed offline using software from Mindware Technologies. The ECG and ICG signals were used to measure mothers' preejection period (PEP) during the puzzle and origami tasks. PEP is the time in milliseconds between ventricular depolarization and the opening of the aortic valve, which is controlled by SNS activity (Sherwood et al., 1990). Shorter PEP indicates greater SNS activity. In our data, PEP was defined as the time between the R-spike onset, or Q-point, in the ECG signal and the opening of the aortic valve as indexed by the B-point in the d*Z*/d*t* signal (first derivative of the change in the ICG signal) (Berntson, Lozano, Chen, & Cacioppo, 2004; Lozano et al., 2007). Mother PEP values were calculated in 30-s epochs over the course of the puzzle and origami tasks and were subsequently averaged to form mean scores of PEP for each mother during the puzzle and origami. Seven and five mothers did not provide usable cardiac data for computing PEP during the puzzle and origami tasks, respectively.

Respiratory sinus arrhythmia—Respiratory sinus arrhythmia (RSA) refers to heart rate variability that corresponds with breathing, with higher RSA indicating greater PNS activity. The high-frequency band-pass parameters to quantify RSA were set to .12 to .40, and sampling rate was set at 500 ms. The d*Z*/d*t* signal was used as an estimate of respiration (Ernst, Litvack, Lozano, Cacioppo, & Berntson, 1999) and was controlled for in the computation of RSA. Spectral analysis of the interbeat interval (IBI) data was used to compute RSA values (Berntson et al., 1997) using Mindware software. Mother RSA was calculated in 30-s epochs over the course of the puzzle and origami tasks, and it was subsequently averaged to form mean scores of RSA for each mother during puzzle and origami. Four and two mothers did not provide usable cardiac data for computing RSA during the puzzle and origami tasks, respectively.

Analyses

Maternal CAB (autonomic reciprocity) and overall CAR (autonomic coactivity) were computed during the puzzle and origami tasks (Berntson et al., 2008). Mean RSA and PEP values first were standardized (*z* transformation). Then, because shorter PEP intervals are associated with greater SNS activity, standardized PEP values were multiplied by −1 so that higher values indexed greater sympathetic activation. Using these values, the inverse values of standardized PEP were subtracted from the standardized values of RSA to create an index of CAB that ranged from negative (higher sympathetic dominance) to positive (higher parasympathetic dominance). This can be expressed algebraically as $CAB = zRSA - (-zPEP)$. To create an index of CAR, the inverse values of standardized PEP were added to the standardized values of RSA such that CAR ranged from negative (coinhibition; low PNS and low SNS activation) to positive (coactivation; high PNS and high SNS activation). This can be expressed algebraically as $CAR = zRSA + (-zPEP)$.

Path analysis was used to test hypothesized relations among maternal compassionate love, physiology, and observed and reported parenting behaviors. Separate models were tested with physiology during the puzzle task and physiology during the origami-folding task as predictors of mothers' task-specific observed warmth and negativity. Self-reported harsh parenting was included in both models as a third dependent variable, and all dependent variables were allowed to covary with each other. Compassionate love for child, task-relevant CAR, task-relevant CAB, and interactions between physiology and compassionate love were included as predictors of each of the three dependent variables. Independent variables were allowed to covary with each other. Interaction variables were centered and formed according to guidelines outlined by Aiken and West (1991). Figure 1 outlines the relations tested in the two models. Full information maximum likelihood (FIML) was used to produce all estimates and account for missing data. Models including compassionate love for humanity were examined in follow-up analyses to determine if predictive effects were specific to compassionate love for child.

Results

Descriptive statistics and correlations among mothers' compassionate love for child, physiology during puzzle, physiology during origami, and parenting are presented in Table 1. Mothers who reported feeling more compassionate love for their children described their parenting as less harsh and demonstrated more warmth toward their child during the low-challenge puzzle task. Higher parasympathetic activation was associated with less sympathetic activation. Mothers with higher parasympathetic activation during both tasks showed less negativity during the puzzle. Observed warmth and negativity during the origami task were moderately negatively correlated with each other. Rank order differences in RSA and PEP were highly stable across the puzzle and origami tasks. Mothers demonstrated more negativity, $t(75) = 3.57$, $p = .001$, and warmth, $t(75) = 3.65$, $p < .001$, during origami than the puzzle. Maternal PEPs were significantly shorter, $t(74) = 2.22$, $p < .05$, and maternal RSA was significantly higher, $t(78) = 5.67$, $p < .001$, during the puzzle than origami. Preliminary analyses showed that mothers with daughters and mothers with

sons did not differ in their physiology, all $|t| < .71$. Therefore, child gender was not included in the models.

Model 1: Predicting Parenting From Physiology in the Puzzle Task

The model of data from the puzzle task accounted for 17% of the variance in mothers' reported harsh parenting, 17% of the variance in observed negativity, and 13% of the variance in observed warmth. The model statistics are presented in Table 2. Compassionate love for child predicted less observed maternal negativity ($\beta = -.23$, $p < .05$) and more observed maternal warmth ($\beta = .27$, $p = .01$) during the puzzle. Compassionate love for child also negatively predicted mother-reported harsh parenting ($\beta = -.39$, $p < .001$). Mothers with higher CAB (parasympathetic dominance) ($\beta = -.23$, $p < .05$) and mothers with higher CAR (parasympathetic and sympathetic coactivation) ($\beta = -.23$, $p < .05$) showed less negativity. The follow-up model including mother-reported compassionate love for humanity in the model did not diminish the associations found for compassionate love for child but did add one interaction effect of CAR significantly moderating the association between compassionate love for child and observed negativity ($\beta = -.23$, $p = .05$). It was only at higher values of CAR that compassionate love was negatively associated with negativity ($\beta = -.40$, $p < .01$) (see Figure 2).

Model 2: Predicting Parenting From Physiology in the Origami Task

The model including data from the origami task accounted for 28% of the variance in mothers' reported harsh parenting, 9% of the variance in observed negativity, and 9% of the variance in observed warmth. The model statistics are presented in Table 3. Greater CAR (coactivation) during the origami-folding task predicted less reported harsh parenting ($\beta = -.28$, $p < .01$). More compassionate love for child also predicted less harsh parenting ($\beta = -.41$, $p < .001$). However, CAB moderated the association of compassionate love for child with harsh parenting ($\beta = .28$, $p < .01$) as well as observed negativity ($\beta = .29$, $p < .05$).

At lower values of CAB (sympathetic dominance), compassionate love for child was negatively associated with reported harsh parenting ($\beta = -.76$, $p < .001$) (see Figure 3a) and observed negativity ($\beta = -.36$, $p = .08$) (see Figure 3b). Conversely, at higher values of CAB (parasympathetic dominance), compassionate love was unrelated to observed or reported parenting. Including mother-reported compassionate love for humanity in the model did not diminish the associations found for compassionate love or add significant effects.[1]

[1]Because the measure of Compassionate Love for child was reported by mothers, it is plausible that some similar measure would yield the same findings. To test this possibility, mothers were also administered the Empathic Concern subscale from the Davis Interpersonal Reactivity Index, which measures the tendency to feel sympathy and compassion for others (Davis, 1983). As explained in the Introduction, sympathy is hypothesized to be related to, but not synonymous with, compassionate love. Compassionate Love for child and Empathic Concern were significantly correlated in our sample of mothers, $r = .37$, $p = .001$. We ran our models replacing the Compassionate Love for child variable with the Empathic Concern variable. Unlike Compassionate Love, Empathic Concern did not have any significant, direct associations with observed or reported parenting in the models. Only one of the moderation effects was maintained: CAB × Empathic Concern predicting mother-reported harsh parenting. This closely replicated the effect observed for Compassionate Love reported in the Results section and Figure 3a: Sympathy only predicted less reported harsh parenting for mothers who show low CAB (SNS dominance). Given that the self-report measure of a related construct, Empathic Concern, failed to show five of the six significant effects identified for Compassionate Love for child in the models, we are reasonably confident that our assessment of Compassionate Love identified a unique and important feature of adaptive parenting.

Discussion

The current study provided evidence that mothers' compassionate love for their children was associated with warmer and less negative and harsh parenting and that mothers with stronger parasympathetic activity during parent–child interactions were also less negative and harsh. However, even more salient was the evidence that compassionate love acted as a protective factor against harsh parenting, particularly in the more challenging parent–child context that evoked maternal sympathetic dominance. Relative to the less challenging puzzle task, mothers were more emotionally aroused, expressing more negativity and more warmth, and they showed a slight decrease in SNS activity coupled with a larger drop in PNS activity during the more challenging origami task, indicative of a shift to greater sympathetic dominance (Berntson et al., 2008). Consistent with the prediction that compassionate love would be protective against stress-induced adverse parenting, compassionate love was associated with less reported harsh parenting and observed negativity in mothers who showed sympathetic dominance (low CAB) during this challenging interaction. Thus, the established link between sympathetically driven high autonomic arousal and harsh parenting (Joosen, Mesman, Bakermans-Kranenburg, & van Ijzendoorn, 2013; Sturge-Apple et al., 2011) was broken when mothers had strong compassionate love for their children. Despite being physiologically stressed, the caring humanism and other-focused goals that underlie a compassionate orientation to caregiving provided mothers with resources they could draw on to avoid resorting to a "fight-or-flight" style of harsh parenting.

Compassionate love also predicted greater maternal warmth during the puzzle task, suggesting that the benefits of compassionate love extend beyond reducing harsh parenting and include promoting positive aspects of caregiving. When faced with mildly challenging parenting situations, having a deep sense of love and selfless concern for one's child may help mothers to express affection.

The importance of parasympathetic activation for effective parenting was evident in both contexts. Maintenance or augmentation of parasympathetic influence facilitates positive social engagement and perception of the environment as safe (Porges, 2011). In mothers with higher CAR (coactivation of PNS and SNS), sympathetic activation might have facilitated mothers' active participation in the challenging origami task, and having that coupled with greater parasympathetic activation might have buffered against experiencing the task as stressful or threatening, thereby supporting mothers' calm social and emotional engagement with their children. Likewise, although negativity was generally low during the puzzle task, mothers displayed the least negativity when they were both more compassionate specifically for their child (after accounting for their compassionate love for humanity) and had higher CAR, suggesting that compassionate love may build on effective physiological regulation in supporting positive parenting. The combination of feeling compassionate love, being physiologically activated and primed for action (high SNS) while also maintaining PNS control to direct that activation into social engagement and cooperation, may help mothers avoid expressions of irritation and frustration.

Similar to mindfulness or contemplative practices, compassion training programs focus on stabilizing the mind and have been linked to lower physiological reactivity to stress (Pace et

al., 2009). Therefore, it could be surprising that we found no significant direct correlations between compassionate love and adaptive physiological functioning during stress (e.g., downregulation of SNS or upregulation of PNS activity). There are several potential sources for this apparent inconsistency in findings. The extent to which compassionate love for child exactly parallels mindfulness or contemplative practices that emphasize loving-kindness is unclear. Mothers' dispositional compassionate love is likely to differ from compassion deliberately cultivated by training in important ways. Mothers with a deep, abiding, and selfless love for their child might not also be mindful and deliberative during stressful activities; thus, it is reasonable that they would experience the normal physiological profile of being frustrated by an impossible task (e.g., sympathetic dominance). However, their compassionate love still would provide a regulatory buffer against behavioral expression of that internal arousal. Furthermore, it is possible that compassionate love in mothers may be more closely associated with other physiological systems, such as the peptide hormones oxytocin and vasopressin (Hastings, Miller, Kahle, & Zahn-Waxler, 2014), or it could be linked to dynamic patterns of autonomic functioning that were not captured by our use of mean level scores of physiological activity (Miller et al., 2013).

In summary, our findings suggest that fostering compassionate love may help mothers, and particularly those who experience strong physiological arousal during difficult parenting situations, to establish positive socialization contexts for their children. These findings are in line with models of mindful parenting that predict more affection and less negativity in parent–child relationships as parents adopt a compassionate stance toward their children (Coatsworth et al., 2010; Duncan et al., 2009). Some intervention work has successfully promoted compassionate love in health professionals (Oman, Thoresen, & Hedberg, 2010), but further research is necessary to determine whether compassionate love in parents is malleable to training. Developing compassionate love specifically in parent–child relationships may be more effective for parenting interventions than efforts to promote compassionate love for others in general. There is also a need for research on how mothers' compassionate love and physiology are potentially linked to children's expressive behaviors, physiological functioning, and social-emotional development. Future research should continue to investigate the potential of contemplative practices aimed at fostering compassionate love for one's child in promoting positive and decreasing problematic aspects of parenting.

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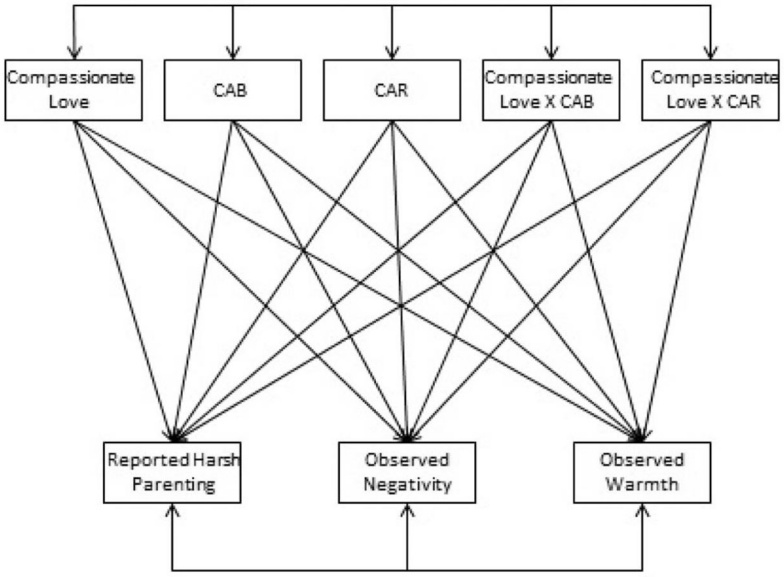

Figure 1.

Model with Compassionate Love for child, CAB, CAR, the interaction of Compassionate Love by CAB, and the interaction of Compassionate Love by CAR predicting the mother-reported harsh parenting, observed negativity, and observed warmth.

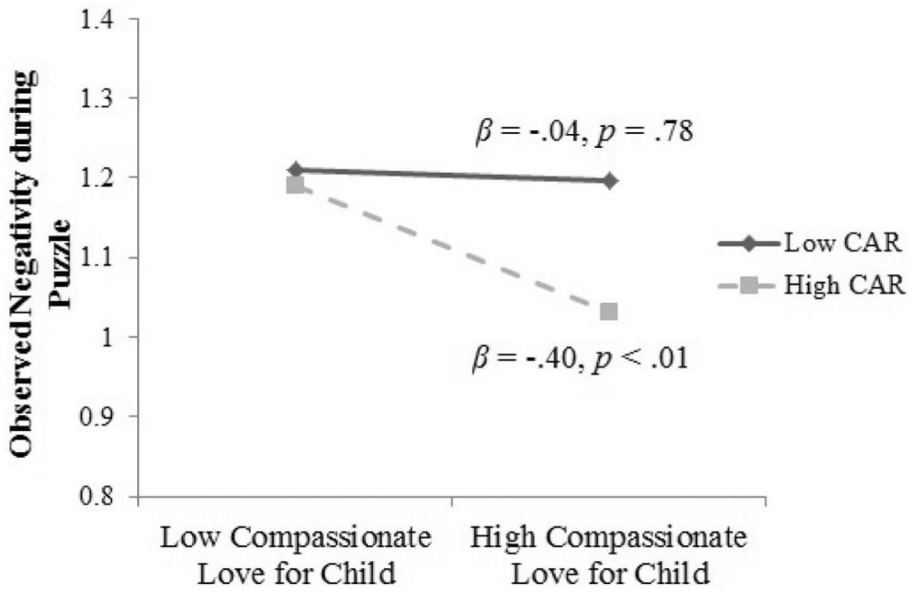

Figure 2.

Compassionate Love is associated with less reported harsh parenting for mothers high in overall parasympathetic and sympathetic regulation activation during the puzzle task. Note: High CAR indicates heightened parasympathetic and sympathetic activation (coactivation); low CAR indicates lower parasympathetic and sympathetic activation (coinhibition).

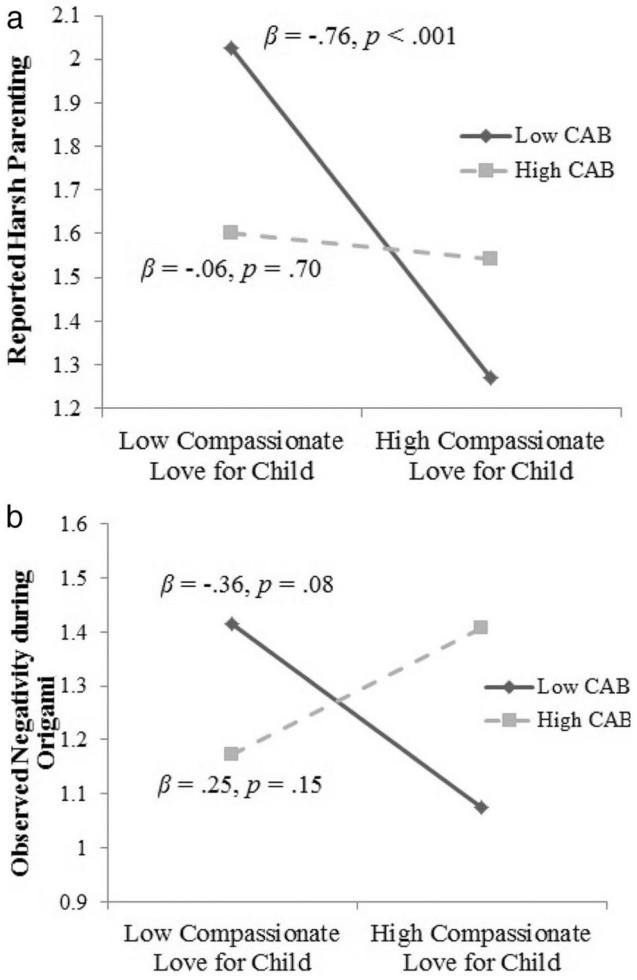

Figure 3.

(a) Compassionate Love is associated with less reported harsh parenting for mothers high in sympathetic dominance during the origami task. Note: High CAB indicates parasympathetic dominance; low CAB indicates sympathetic dominance. (b) Compassionate Love is associated with less observed negativity for mothers high in sympathetic dominance during the origami task. Note: High CAB indicates parasympathetic dominance; low CAB indicates sympathetic dominance.

Table 1

Zero-Order Correlations and Descriptive Statistics

	1	2	3	4	5	6	7	8	9	10	11
1. Compassionate Love for Child	1										
2. Compassionate Love for Humanity	.27*	1									
3. Puzzle task RSA	−.09	−.01	1								
4. Puzzle task PEP	−.10	−.05	.28*	1							
5. Origami task RSA	−.06	−.04	.93**	.31**	1						
6. Origami task PEP	−.10	−.03	.24*	.90**	.29*	1					
7. Puzzle Warmth	.22*	.08	.04	.15	.01	.19	1				
8. Puzzle Negativity	−.15	−.05	−.30**	−.08	−.24*	.00	−.17	1			
9. Origami Warmth	−.02	−.11	.13	.17	.06	.22	.24*	− .36**	1		
10. Origami Negativity	.02	−.07	−.10	.11	−.08	.10	.00	.38**	−.38**	1	
11. PSDQ Harsh Parenting	−.34**	−.05	−.06	.00	−.10	.08	−.14	.63**	.02	.19	1
M	6.71	4.84	6.23	136.08	5.97	137.81	2.57	1.09	2.93	1.24	1.59
SD	.31	.92	1.03	15.00	.89	16.81	.56	.20	.72	.46	.50

Note. PSDQ = Parenting Styles and Dimensions Questionnaire. Higher PEP values indicate lower sympathetic nervous system activity.

* $p < .05$.

** $p < .01$, two-tailed.

Table 2

Model 1: Parameter Estimates of the Effects of Physiology During Puzzle Task and Compassionate Love for Child on Parenting

	Reported harsh parenting		Observed negativity during puzzle task		Observed warmth during puzzle task	
Variable	**Estimate**	**CR**	**Estimate**	**CR**	**Estimate**	**CR**
Puzzle task CAB	−.03	0.31	−.23*	2.10	.09	0.85
Puzzle task CAR	−.06	0.56	−.23*	2.03	−.09	0.74
Compassionate Love for Child	−.39***	3.71	−.23*	2.17	.27**	2.53
CAB × Compassionate Love	.18	1.68	.18	1.24	−.21	1.89
CAR × Compassionate Love	−.15	1.31	−.15	1.87	.14	1.17

Note. Standardized estimates and critical ratios (CR). Critical ratios > 1.96 are significant at the .05 level or better.

* $p < .05$.

** $p < .01$.

*** $p < .001$, two-tailed.

Table 3

Model 2: Parameter Estimates of the Effects of Physiology During Origami Task and Compassionate Love for Child on Parenting

	Reported harsh parenting		Observed negativity during origami task		Observed warmth during origami task	
Variable	**Estimate**	**CR**	**Estimate**	**CR**	**Estimate**	**CR**
Origami task CAB	−.08	0.78	.05	0.41	.12	1.05
Origami task CAR	−.28**	2.84	−.18	1.59	−.17	1.46
Compassionate Love for Child	−.41***	3.98	−.06	0.46	.03	0.21
CAB × Compassionate Love	.28**	2.66	.24*	2.02	−.22	1.88
CAR × Compassionate Love	−.19	1.78	−.11	0.85	−.01	0.04

Note. Standardized estimates and critical ratios (CR). Critical ratios greater than 1.96 are significant at the .05 level or better.

* $p < .05$.

** $p < .01$.

*** $p < .001$, two-tailed.